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AUTHORITY

OACS FOR, D/A ltr, 13 Sep 1973

DEPARTMENT OF THE ARMY
ARMY CONCEPT TEAM IN VIETNAM
APO San Francisco 96384

AVIB-CO

31 January 1968

SUBJECT: Final Report - Vertical Reach Pendant

TO: Commanding General
United States Army Vietnam
ATTN: AVHGC-DST
APO 96375

1. Reference: Letter, AVHGC-DH, Headquarters, US Army Vietnam, 23 February 1967, subject: Letter of Instruction.

2. In accordance with the provisions of the foregoing reference, the attached final report is forwarded for review and transmittal to Department of the Army.

3. Request a copy of the USARV and CINCUSARPAC forwarding indorsements be furnished the Commanding Officer, Army Concept Team in Vietnam (ACTIV).

FOR THE COMMANDER:

1 Incl
as

F. A. KLEIN
CPT, AGC
Adjutant

AVHGC-DST (31 Jan 68) 1st Ind
SUBJECT: Final Report of Evaluation - Vertical Reach Pendant

HEADQUARTERS, UNITED STATES ARMY VIETNAM, APO San Francisco 96375 23 FEB 1968

TO: Commander in Chief, United States Army, Pacific, ATTN: GPOP-DT
APO 96558
Commanding Officer, Army Concept Team in Vietnam, APO 96384

1. This headquarters concurs with the findings, conclusions, and recommendations contained in the attached report with the following reservation: The Vertical Reach Pendant should be issued to the supported units rather than the medium helicopter companies. Supported units are currently authorized and have on hand cargo sling and cargo aerial delivery equipment to meet their requirements. The Vertical Reach Pendant should be added to this authorized list of equipment. A revised BOI for aerial delivery equipment is currently being prepared and will be forwarded upon completion.

2. The statement in the discussion, page 4, paragraph 8c, concerning saving one and one-half hours flying time on a lift of approximately 50 sorties, appears to be excessive. A more realistic saving per hookup is felt to be five to ten seconds.

FOR THE COMMANDER:

CHARLES A. BYRD
Major, AGC
Assistant Adjutant General

1 Incl
nc

DEPARTMENT OF THE ARMY
ARMY CONCEPT TEAM IN VIETNAM
APO San Francisco 96384

AVIB-AAD 31 January 1968

SUBJECT: Final Report - Vertical Reach Pendant (ACA-44/67I)

TO: Commanding General
United States Army Vietnam
ATTN: AVHGC
APO 96375

1. REFERENCES

a. Msg, CG, USARV 03484, Jan 67, subject: Vertical Reach Pendant.

b. Msg, DA 98946, Jan 67, subject: Vertical Reach Pendant.

2. PURPOSE

Determine if the Vertical Reach Pendant (VRP) is suitable for Army use in combat operations.

3. BACKGROUND

a. Present procedures utilized in helicopter sling loading operations are not optimized in that the helicopter is required to hover extremely close to both the cargo and cargo handler. Hovering at the required proximity to both the handler and cargo is potentially dangerous to the cargo handler and occasionally causes damage to the helicopter. The cargo handler stands on the load and attaches the sling from the cargo to the helicopter by hand. The Vertical Reach Pendant, however, is designed to permit hovering the helicopter higher above the load as it is being attached by the cargo handler while he stands on the ground.

b. The US Marine Corps has reported significant success using a similar device with the CH-46 helicopter.

4. DEFINITION OF TERMS

a. Cargo slings - Straps (usually nylon) that are fastened to cargo or equipment prior to lifting by helicopter as external loads.

b. Cargo net sling - A net used to carry multiple small parcels under a helicopter, usually fabricated of steel or nylon.

5. DESCRIPTION OF MATERIEL

The VRP is made of polyester poly (dacron) rope approximately 1¼ inches in diameter and 13 feet long (figure 1). The upper end of the rope has a 10-inch oblong loop. The length of rope next to this loop is encased in hard plastic tubing. The next 6 feet has been dipped in liquid dacron after assembly with the remaining rope length either looped or tipped with a steel safety hook. Twenty-five of each type were evaluated. The entire assembly is stressed for a dynamic loading capacity of 10,000 pounds.

6. OBJECTIVES

a. Objective 1 - Suitability

Determine if the Vertical Reach Pendant is a suitable method of connecting cargo slings or cargo net slings to the helicopter.

b. Objective 2 - Reliability and Maintainability

Determine the reliability and durability of the Vertical Reach Pendant.

c. Objective 3 - Safety and Speed

Determine if the use of the Vertical Reach Pendant increases the safety and speed of connecting external loads to the helicopter.

7. EVALUATION DESIGN

a. The equipment was tested during combat support movement by helicopter of equipment and supplies for units conducting counterinsurgency operations in Southeast Asia. A medium helicopter company (Chinook) was involved in testing equipment from 28 August to 26 October 1967.

b. Questionnaires were issued with the test items to the operational unit. Quantitative data were collected and statistically analyzed upon completion of the test period. In addition, qualitative data pertinent to the performance of the test items were collected from qualified aviation personnel.

c. The evaluation was conducted on a non-interference basis during combat operations. Most of the required data were normally recorded by the using units, thus minimizing effort expended solely for data collection. No effort was made to move equipment and supplies for the purpose of data collection only.

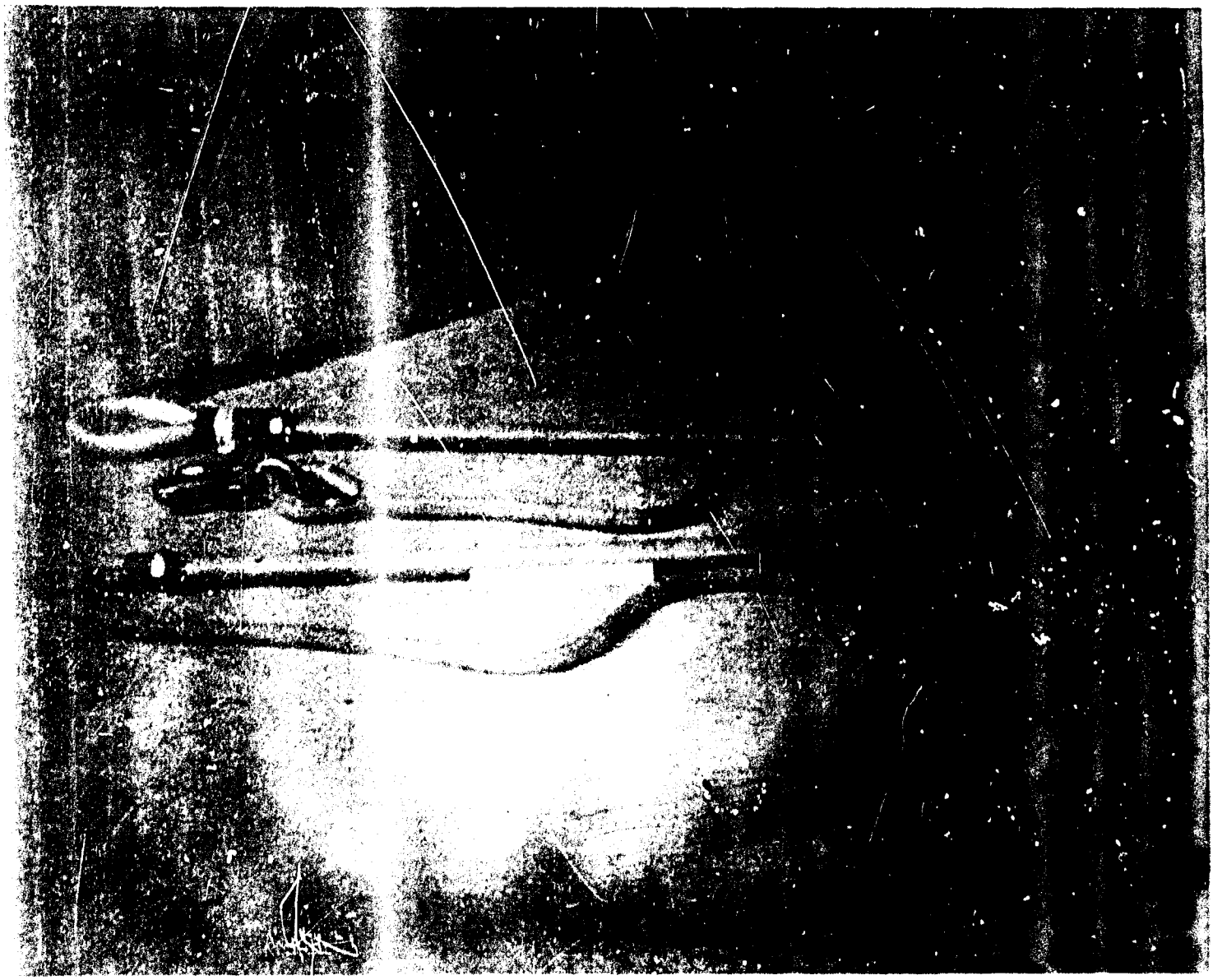

Figure 1. Two Types of VAF Tested

d. The evaluated item, except for two broken units to be returned to AVSCOM, ATTN: AMSAU-EAC, will remain with the participating company.

8. DISCUSSION

a. Objective 1 - Suitability

The VRP was used exclusively throughout the test period to connect various external loads in nets and slings to the helicopters. An inexperienced individual could easily connect the VRP to the hook as the helicopter hovered within reach. The length of the VRP was considered optimum. The VRP with the steel hook was found to be preferred.

b. Objective 2 - Reliability and Durability

Approximately 2800 sorties were flown during the test period. Two VRP's are known to have failed (Figure 2) and two additional failures were reported, thus indicating an average life of at least 50 sorties. The solid plastic sleeve is fixed in position and opaque; hence, visual inspection is impossible. In order to permit inspection, the tube could be made movable and transparent. As an added modification, a swivel device inserted in the lower end of the VRP (the end which attaches to the cargo) would prevent wear caused by twisting and burning while transporting large bulky loads and those of symmetrical shape. The inside of the upper loop could also be lined with a material that would not burn because of friction resulting from continuous rubbing against the metal hook. To prolong useful life and reduce stretching, the tensil strength should be increased; moreover, utilization of the VRP with the CH-47B with increased capability will necessitate almost double the strength of this present design. Every VRP that failed did so at approximately midpoint (see figure 3). When the VRP is under a heavy load, this point is at the lower end of the opaque plastic tube, indicating possible chaffing. A clear plastic sleeve, heretofore unmentioned, was unattached and hidden under the plastic tube. This transparent sleeve may have been designed to prevent wear or chaffing between the rope and the opaque tube. However, under a heavy load, the rope stretched and the decrease in diameter permitted the clear plastic sleeve to slide down the rope negating the apparent design purpose.

c. Objective 3 - Safety and Speed

The VRP definitely increased the safety margin for both handler and helicopter. Since close hovering to the load or handler was unneccessary, the potential danger of injury to crewmen or aircraft damage was reduced. Neither injuries to crewmen nor damage to aircraft was reported by unit utilizing the VRP during the evaluation. The cost-effectiveness of the 50 VRP's used for the test was confirmed during the first large lift. One and one-half hours flying time was saved on a lift of approximately 50 sorties. Total calculation of sorties employing VRP's saved approximately 84 hours flying time during the test. The US Army

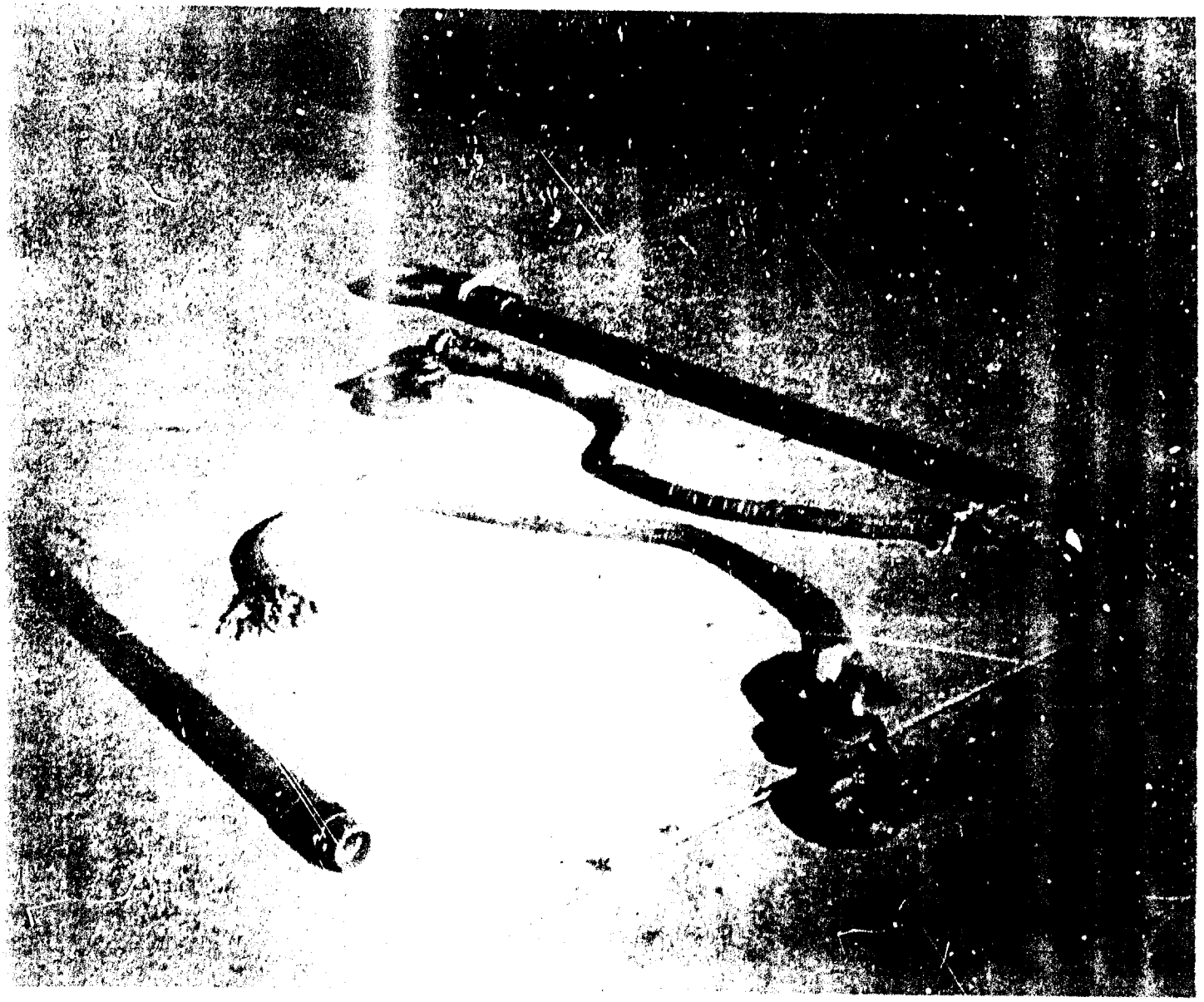

Figure 2. Broken VitP

Figure 3. Typical break in VLP

Aviation Test Board determined the cost of operating a CH-47A at $1,000 per hour. The cost of one pendant, in test quantity, was $100. Total cost of pendants was $5,000. Total savings is computed at $79,000 and many of the pendants are still serviceable.

9. FINDINGS

a. The VRP was used in 2800 sorties without reported damage to either aircraft or crewmember.

b. The inability to thoroughly inspect the VRP degrades its reliability.

c. During the 2800 sorites approximately 84 hours flying time was calculated to have been saved.

10. CONCLUSIONS

a. The VRP is a suitable method for connecting an external load to a CH-46/47 type helicopter.

b. The reliability and durability of the VRP is unacceptable in present design.

c. The VRP is a safer and faster method of connecting loads to helicopters than those presently being used.

11. RECOMMENDATIONS

a. Reccmmend the following modifications be made on the VRP:

(1) To allow visual inspection of the rope, the rigid plastic tube be made of transparent material, inspection slots be provided in the tube, or the tube be constructed so that it can be moved along the rope.

(2) A swivel device be incorporated at the lower (load) end of the VRP.

(3) A low friction, non-thermoplastic be used to line the upper loop.

(4) The tensil strength be increased to twice that of the present design.

(5) Changes in the rigid plastic tube and/or the transparent sleeve be made to eliminate fraying of the rope.

b. These VRP's should be procured, when modified as indicated, for Army-wide use on a basis of 100 per medium helicopter company.

c. Similar equipment should be considered for connecting all external loads to all types of helicopters.

d. In the event the incorporation of all modifications listed above will introduce delay in availability of VRP's in RVN, an interim procurement should be initiated incorporating the modifications contained in (a) above (to permit inspection) and (e) above (to prevent fraying of the rope). These modifications should be tested in CONUS prior to RVN delivery.

J Elmore Swenson

1 Incl
Distribution

J ELMORE SWENSON
Colonel, Artillery
Commanding

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11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
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13. ABSTRACT

The VRP is made of polyester poly (dacron) rope approximately 13 feet long and 1¼ inches in diameter. The upper end of the rope has a 10 inch oblong loop. The length of rope next to this loop is encased in hard plastic tubing. The next 6 feet has been dipped in liquid dacron after assembly with the remaining rope length either looped or tipped with a steel safety hook. Twenty-five of each type were evaluated by the 147th ASI Company. The entire assembly is stressed for a dynamic loading capacity of 10,000 pounds. The VRP was found to be suitable for connecting external loads to CH-47A helicopters. It is a safer and faster method than those presently being used. However, the reliability and durability of the present design was found unacceptable.

DD FORM 1 NOV 68 1473 (REPLACES DD FORM 1473, 1 JAN 66, WHICH IS OBSOLETE FOR ARMY USE.)

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14. KEY WORDS	LINK A		LINK B		LINK C	
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VERTICAL .EACH PENDANT						

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